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NASA CR-144781

SOIL-MOISTURE GROUND TRUTH

HAND COUNTY, SOUTH DAKOTA
April 27, 1976

(NASA-CR-144781) SOIL-MOISTURE GROUND
TRUTH, HAND COUNTY, SOUTH DAKOTA (Bittinger
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April 1976
Mission Report--April 27, 1976, Mission

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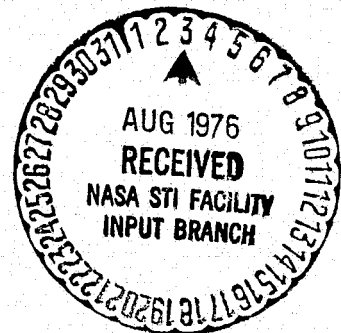


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SOIL-MOISTURE GROUND TRUTH
HAND COUNTY, SOUTH DAKOTA
April 27, 1976, Mission

INTRODUCTION

This report contains the ground-truth data taken at the Hand County, South Dakota, soil-moisture study site on April 27, 1976. The general location of this site is shown in Figure 1. These data were taken by M. W. Bittinger & Associates, Inc., personnel with assistance from Tom Schmugge, NASA-GSFC.

HAND COUNTY, SOUTH DAKOTA, SITE

The detailed location of the Hand County site is shown in Figure 2. Figure 3 shows the field numbering system used by NASA for this study site. The lines sampled for soil moisture during this mission are also shown in Figure 2. For the sake of clarity the lines have been indicated as "North," "Middle" and "South." It will be noted that these lines are not continuous in some cases but are line segments. These lines were established after a joint field review of cropping patterns and topography.

Soil samples were taken in the field for later laboratory gravimetric analysis to determine soil moisture content. The typical sampling pattern used is illustrated in Figure 4. Samples were taken for three depths at each sampling point--0 to 1 inch, 0 to 2 inches, and 0 to 4 inches.

SOIL-MOISTURE DATA

Soil types were determined from the Soil Survey of Hand County, South Dakota (White, Westin and Buntley 1963). The soil types encountered on the soil-moisture lines (Figure 2) are summarized in Table 1.

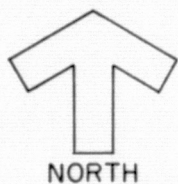
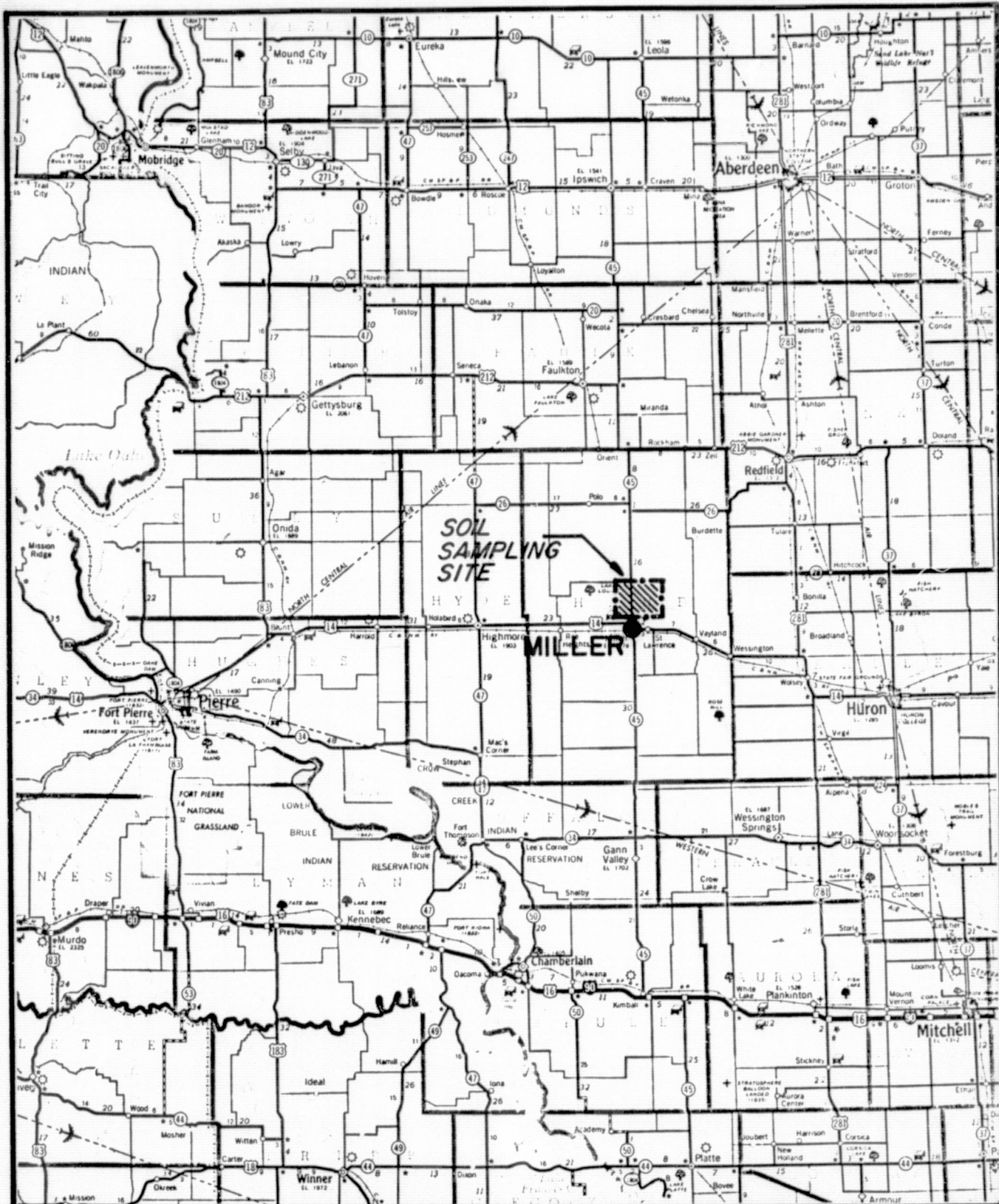
The actual soil-moisture data are presented in Tables 2 through 14. The data have been divided by range, township and section. Tables 15 and 16 briefly summarize the soil-moisture data obtained in fields of winter wheat and spring wheat.

SOIL TEXTURAL ANALYSIS

Based on the soils maps of Hand County (White, Westin and Buntley 1963), various samples were composited by reported soil types and were subjected to textural analysis. This was done for the following soils:

- BcA - South Line - Bonilla-Cresbard loam
- ChA - North Line - Cavour-Houdek loam
- HkB - North Line - Houdek-Bonilla loam
- HkB - South Line - Houdek-Bonilla loam

The results of this laboratory analysis are attached as Appendix A.



0 5 10 20
SCALE (in miles)

Figure 1. Site Location
Hand County, South Dakota

M. W. BITTINGER & ASSOCIATES, INC.
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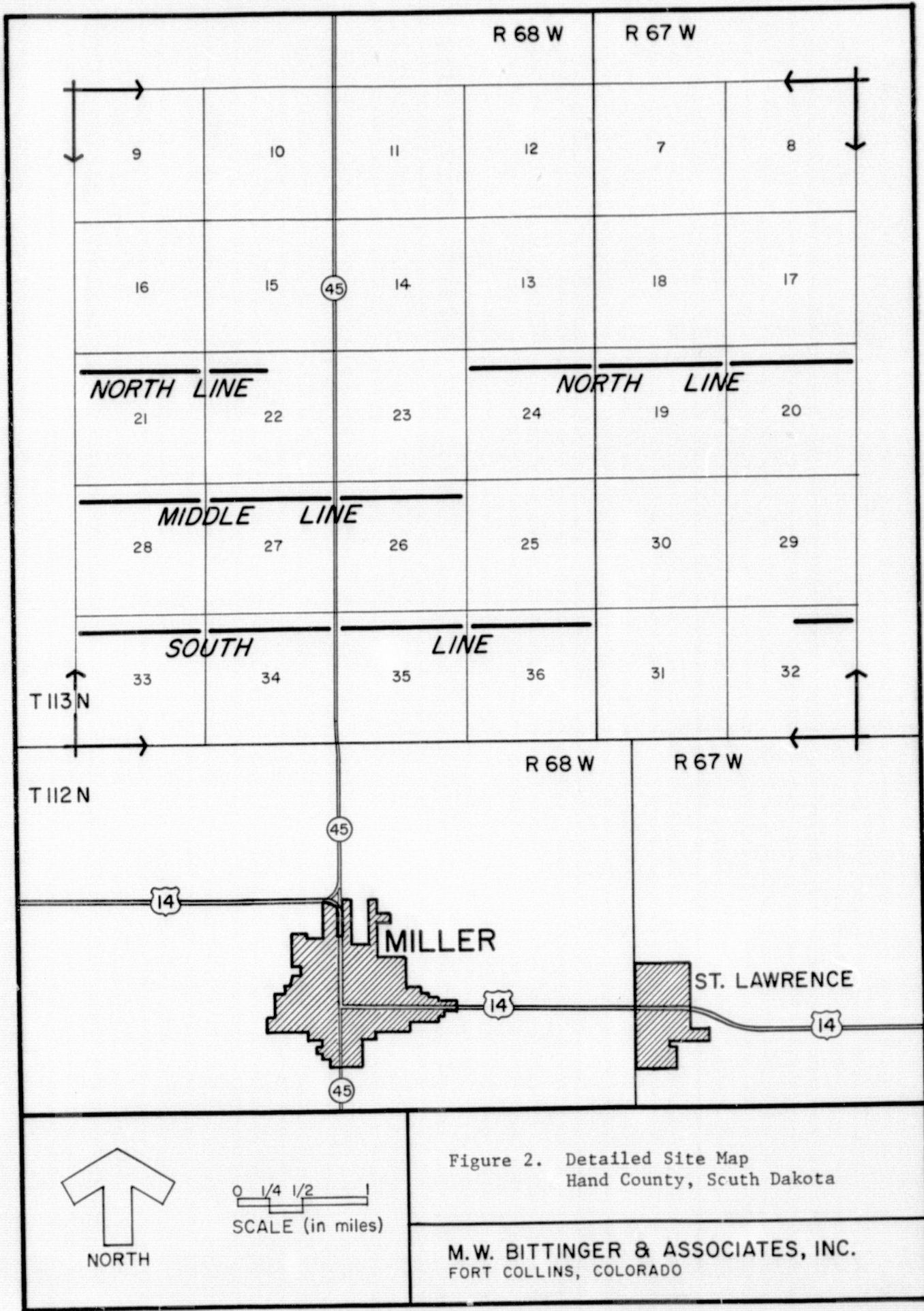
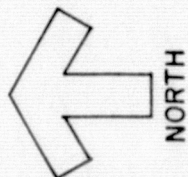
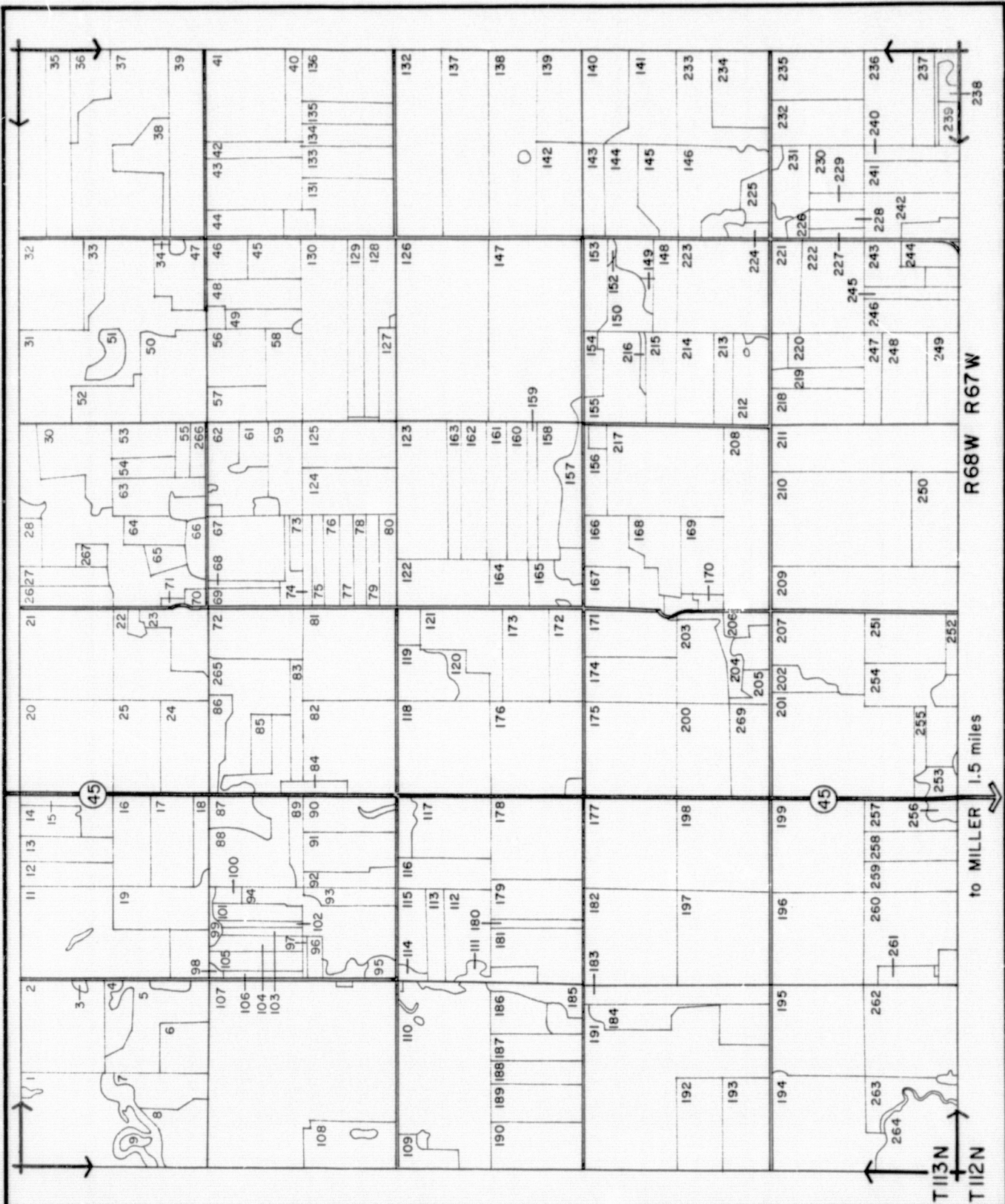


Figure 2. Detailed Site Map
Hand County, South Dakota

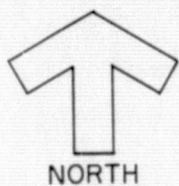
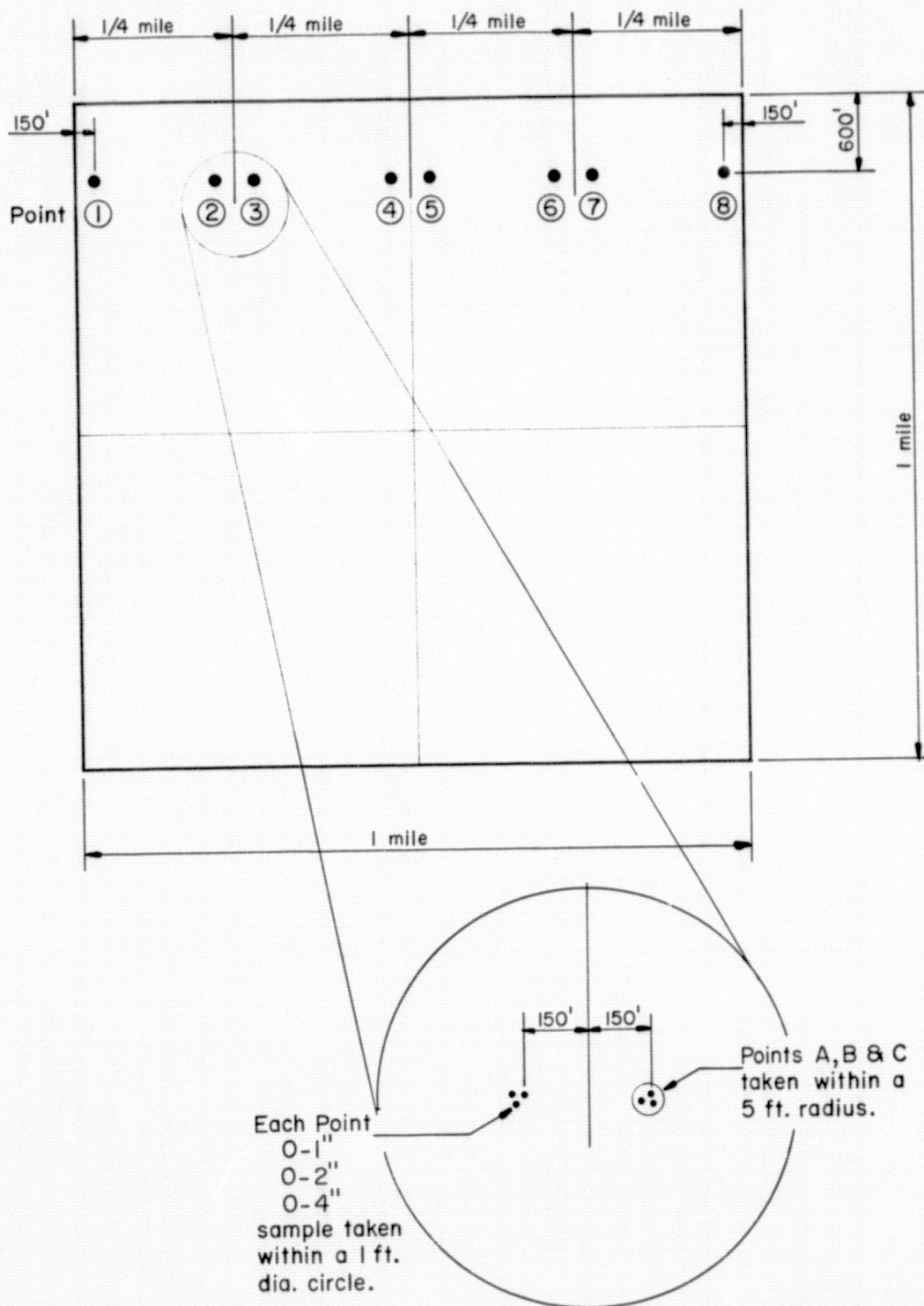
M.W. BITTINGER & ASSOCIATES, INC.
FORT COLLINS, COLORADO



0 1 2 4
SCALE (1000')

Figure 3. Site Field Numbers
Hand County, South Dakota

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SCALE VARIES

Figure 4. Typical Sampling Pattern
Hand County, South Dakota

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FORT COLLINS, COLORADO

Table 1

Soil Legend^{1/}

BcA - Bonilla-Cresbard loam, nearly level
ChA - Cavour-Houdek loams, nearly level
HhB - Houdek loam - undulating
HkA - Houdek-Bonilla loams, nearly level
HkB - Houdek-Bonilla loams, undulating
HlA - Houdek-Cavour loams, nearly level
HlB - Houdek-Cavour loams, undulating
HuD - Houdek-Zahl loams rolling
LbA - LaDelle silt loam, nearly level
LeA - LaDelle-Aberdeen silty clay loams, nearly level
LlA - LaDelle-Lamoure silt loams, nearly level
MhA - Miranda-Houdek complex nearly level
Tw - Tetonka silt loam, somewhat poorly drained

^{1/}Ref: White, E. M., Westin, F. C. and G. J. Buntley, 1963.

Table 2

Soil Moisture Mission
April 27, 1976

Hand County, South Dakota Site

Data from North Line, Sec. 21 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1-ABC	104	HhB				Too complex for meaningful sample. Winter wheat--about 8" tall.
2A	110	HkB	0-1 0-2 0-4	725 556 558	10.4 13.52 13.07	Winter wheat
2B	110	HkB	0-1 0-2 0-4	564 557 563	11.36 14.6 14.2	Winter wheat
2C	110	HkB	0-1 0-2 0-4	571 566 575	13.04 13.01 14.09	Winter wheat
3A	110	HkB	0-1 0-2 0-4	568 576 569	12.6 13.8 14.12	Winter wheat--soil appears to have higher clay content.
3B	110	HkB	0-1 0-2 0-4	574 570 555	10.63 11.88 15.6	Winter wheat--dry top soil.
3C	110	HkB	0-1 0-2 0-4	567 565 573	8.2 13.7 14.8	Winter wheat
4A	110	H1B	0-1 0-2 0-4	749 756 733	5.31 9.10 11.67	Winter wheat
4B	110	H1B	0-1 0-2 0-4	740 737 748	6.37 11.34 12.63	Winter wheat
4C	110	H1B	0-1 0-2 0-4	734 742 735	6.70 11.17 12.67	Winter wheat

Table 2 (continued)

Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from North Line, Sec. 21 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
5-A	110	HkB	0-1	738	7.24	Winter wheat
			0-2	741	9.59	
			0-4	744	12.57	
5-B	110	HkB	0-1	736	7.72	Winter wheat
			0-2	739	10.63	
			0-4	743	11.20	
5-C	110	HkB	0-1	732	5.54	Winter wheat
			0-2	572	10.6	
			0-4	724	13.28	
6-A	110	HkB	0-1	655	4.65	Winter wheat
			0-2	650	13.4	
			0-4	658	15.2	
6-B	110	HkB	0-1	653	4.5	Winter wheat
			0-2	750	12.4	
			0-4	651	15.0	
6-C	110	HkB	0-1	659	5.3	Winter wheat
			0-2	745	12.77	
			0-4	654	15.9	
7-A	110	HkB	0-1	652	5.35	Density and height of wheat has been decreasing since Point 21-2.
			0-2	752	14.2	
			0-4	660	17.8	
7-B	110	HkB	0-1	753	8.7	Winter wheat
			0-2	754	13.75	
			0-4	755	17.5	
7-C	110	HkB	0-1	751	6.65	Winter wheat
			0-2	746	12.77	
			0-4	747	16.33	
8-A	110	HkB	0-1	665	4.5	Winter wheat
			0-2	666	13.2	
			0-4	671	13.3	

Table 2 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 21 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
8-B	110	HkB	0-1	672	6.1	Winter wheat
			0-2	664	11.6	
			0-4	649	12.8	
8-C	110	HkB	0-1	656	7.5	Winter wheat
			0-2	657	12.9	
			0-4	663	14.5	

Table 3

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 22 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1-ABC	114	L1A				Too complex for meaningful sample.
2A	115	HkB	0-1	661	5.9	Emerging spring wheat
			0-2	679	12.5	
			0-4	673	19.7	
2B	115	HkB	0-1	684	6.2	Spring wheat
			0-2	675	19.3	
			0-4	667	19.1	
2C	115	HkB	0-1	669	4.4	Spring wheat
			0-2	682	14.3	
			0-4	674	17.6	
3A	115	HkA	0-1	681	6.2	
			0-2	670	20.1	
			0-4	668	21.1	
3B	115	HkA	0-1	662	8.4	
			0-2	680	18.4	
			0-4	677	19.6	
3C	115	HkA	0-1	676	4.6	
			0-2	678	15.2	
			0-4	683	18.8	

Table 4
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from North Line, Sec. 24 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	122	MhA/ChA	0-1	901	24.18	Native grass pasture, high organic soil content. Photo looking southeast.
			0-2	906	22.56	
			0-4	922	19.64	
1B	122	MhA/ChA	0-1	903	26.62	Native grass pasture
			0-2	920	26.29	
			0-4	905	22.01	
1C	122	MhA/ChA	0-1	907	24.02	Native grass pasture
			0-2	908	24.39	
			0-4	902	24.75	
2A	122	ChA	0-1	909	24.89	Native grass pasture, high organic soil content
			0-2	911	26.71	
			0-4	904	22.45	
2B	122	ChA	0-1	917	27.46	Native grass pasture
			0-2	923	24.28	
			0-4	918	22.31	
2C	122	ChA	0-1	910	23.39	Native grass pasture
			0-2	924	25.65	
			0-4	916	22.77	
3A	123	ChA	0-1	915	10.17	Spring wheat
			0-2	919	16.85	
			0-4	914	17.98	
3B	123	ChA	0-1	921	10.33	Spring wheat Photo #2 & 3 both look- ing northwest
			0-2	912	15.58	
			0-4	913	16.94	
3C	123	ChA	0-1	935	8.11	Spring wheat
			0-2	936	15.11	
			0-4	930	17.10	

Table 4 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 24 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	123	ChA	0-1	927	9.2	Spring wheat, sandy loam
			0-2	926	14.4	
			0-4	932	15.8	
4B	123	ChA	0-1	929	11.66	Spring wheat
			0-2	933	14.98	
			0-4	925	16.7	
4C	123	ChA	0-1	928	11.3	Spring wheat
			0-2	934	15.63	
			0-4	931	16.18	
5A	123	ChA	0-1	767	12.39	Spring wheat, sandy loam
			0-2	758	18.7	
			0-4	757	20.4	
5B	123	ChA	0-1	763	12.0	Spring wheat
			0-2	764	18.64	
			0-4	766	20.5	
5C	123	ChA	0-1	762	12.04	Spring wheat
			0-2	768	17.67	
			0-4	765	20.2	
6A	123	ChA	0-1	760	10.11	Spring wheat, sandy loam soil
			0-2	759	15.46	
			0-4	761	16.71	
6B	123	ChA	0-1	779	10.59	Spring wheat
			0-2	780	15.67	
			0-4	773	19.00	
6C	123	ChA	0-1	770	10.08	Spring wheat
			0-2	769	14.52	
			0-4	774	16.55	

Table 4 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 24 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	123	ChA	0-1	778	9.78	Spring wheat
			0-2	775	18.51	
			0-4	771	21.24	
7B	123	ChA	0-1	782	12.22	Spring wheat
			0-2	776	18.40	
			0-4	781	20.84	
7C	123	ChA	0-1	777	10.31	Spring wheat
			0-2	772	19.03	
			0-4	789	21.80	
8A	123	Tw	0-1	801	8.72	Spring wheat, sandy loam
			0-2	791	14.57	
			0-4	787	17.10	
8B	123	Tw	0-1	799	9.96	
			0-2	796	12.19	
			0-4	803	18.35	
8C	123	Tw	0-1	800	8.33	
			0-2	798	14.24	
			0-4	802	17.86	

Table 5
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from North Line, Sec. 19 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	126	ChA	0-1	804	10.45	Sandy loam--loam-- summer fallow
			0-2	797	12.9	
			0-4	788	16.5	
1B	126	ChA	0-1	785	7.57	Summer fallow--loam
			0-2	786	11.35	
			0-4	790	15.5	
1C	126	ChA	0-1	792	7.2	Loam--summer fallow
			0-2	783	10.5	
			0-4	784	14.04	
2A	126	ChA	0-1	806	7.2	
			0-2	805	11.7	
			0-4	809	15.0	
2B	126	ChA	0-1	794	8.5	
			0-2	823	12.4	
			0-4	815	14.63	
2C	126	ChA	0-1	813	5.51	Summer fallow
			0-2	828	11.9	
			0-4	807	13.3	
3A	126	ChA	0-1	824	7.7	Summer fallow
			0-2	808	12.6	
			0-4	816	17.6	
3B	126	ChA	0-1	793	7.6	Summer fallow
			0-2	812	12.11	
			0-4	814	14.83	
3C	126	ChA	0-1	810	7.64	Summer fallow
			0-2	795	12.87	
			0-3	811	15.77	

Table 5 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 19 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	126	ChA	0-1	703	6.0	Summer fallow
			0-2	707	8.2	
			0-4	705	11.8	
4B	126	ChA	0-1	702	6.8	Summer fallow
			0-2	704	10.5	
			0-4	686	14.1	
4C	126	ChA	0-1	690	7.0	
			0-2	685	10.8	
			0-4	689	14.5	
5A	126	ChA	0-1	692	5.7	Summer fallow
			0-2	694	10.1	
			0-4	706	8.1	
5B	126	ChA	0-1	691	5.5	Summer fallow--loam
			0-2	695	11.0	
			0-4	687	14.3	
5C	126	ChA	0-1	688	5.8	Summer fallow--loam
			0-2	693	10.8	
			0-4	696	14.0	
6A	126	ChA	0-1	701	5.4	Summer fallow--loam
			0-2	713	9.9	
			0-4	697	12.8	
6B	126	ChA	0-1	698	7.0	Summer fallow--loam
			0-2	709	11.2	
			0-4	711	13.7	
6C	126	ChA	0-1	717	17.2	
			0-2	699	9.1	
			0-4	714	13.4	

Table 5 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 19 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	126	ChA	0-1	712	5.3	
			0-2	720	12.0	
			0-4	715	13.9	
7B	126	ChA	0-1	710	4.1	
			0-2	718	14.1	
			0-4	716	15.1	
7C	126	ChA	0-1	700	5.2	
			0-2	719	10.2	
			0-4	708	14.5	
8-ABC	126					Barn---no sample

Table 6
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from North Line, Sec. 20 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	132	ChA	0-1	867	8.3	Spring wheat, Picture #7
			0-2	871	14.7	
			0-4	874	20.2	
1B	132	ChA	0-1	870	10.4	Spring wheat
			0-2	876	15.0	
			0-4	866	20.0	
1C	132	ChA	0-1	868	8.6	Spring wheat
			0-2	875	18.6	
			0-4	869	21.8	
2A	132	HkA	0-1	892	7.8	Spring wheat
			0-2	888	15.1	
			0-4	884	17.2	
2B	132	HkA	0-1	890	7.0	Spring wheat
			0-2	891	15.0	
			0-4	883	18.6	
2C	132	HkA	0-1	878	5.6	Spring wheat
			0-2	882	13.1	
			0-4	879	18.0	
3A	132	HkA	0-1	886	8.8	
			0-2	873	12.1	
			0-4	877	15.0	
3B	132	HkA	0-1	872	9.1	Spring wheat
			0-2	865	12.3	
			0-4	881	15.3	
3C	132	HkA	0-1	880	7.8	Spring wheat
			0-2	887	12.5	
			0-4	885	15.2	

Table 6 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 20 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	132	H1A	0-1	723	8.9	
			0-2	728	17.0	
			0-4	726	19.4	
4B	132	H1A	0-1	721	9.4	Spring wheat
			0-2	729	16.5	
			0-4	722	20.3	
4C	132	H1A	0-1	731	9.6	Spring wheat
			0-2	893	17.4	
			0-4	897	21.1	
5A	132	H1A	0-1	896	11.8	Spring wheat
			0-2	898	17.9	
			0-4	727	23.0	
5B	132	H1A	0-1	730	11.7	Spring wheat
			0-2	899	18.1	
			0-4	889	20.5	
5C	132	H1A	0-1	895	9.1	Spring wheat
			0-2	894	15.8	
			0-4	900	23.8	
6A	132	Tw	0-1	542	9.0	Spring wheat
			0-2	550	16.9	
			0-4	547	15.4	
6B	132	Tw	0-1	554	10.0	Spring wheat
			0-2	559	15.3	
			0-4	561	19.1	
6C	132	Tw	0-1	548	8.7	Spring wheat
			0-2	553	14.5	
			0-4	560	20.4	

Table 6 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from North Line, Sec. 20 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	132	Tw	0-1	551	7.6	Spring wheat
			0-2	544	14.0	
			0-4	562	16.9	
7B	132	Tw	0-1	541	7.5	Spring wheat
			0-2	543	14.6	
			0-4	546	19.0	
7C	132	Tw	0-1	552	4.0	Spring wheat
			0-2	549	16.7	
			0-4	545	20.9	
8A	132	Tw	0-1	818	9.1	Spring wheat--sandy loam, loam
			0-2	822	16.1	
			0-4	821	20.7	
8B	132	Tw	0-1	817	9.5	
			0-2	825	17.6	
			0-4	826	19.1	
8C	132	Tw	0-1	827	13.4	
			0-2	820	17.0	
			0-4	819	20.4	

Table 7
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from Middle Line, Sec. 28 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	191	HkB	0-1	49	16.4	50 paces east of west end, middle line; pasture, native grass, short; high organic content in soil.
			0-2	57	17.2	
			0-4	60	13.1	
1B	191	HkB	0-1	50	17.0	Pasture, native grass
			0-2	56	17.1	
			0-4	51	14.0	
1C	191	HkB	0-1	67	13.4	Pasture, native grass
			0-2	61	13.8	
			0-4	85	12.6	
2A	191	HkB	0-1	77	16.7	Pasture, native grass
			0-2	84	20.5	
			0-4	68	19.2	
2B	191	HkB	0-1	66	19.9	Pasture, native grass
			0-2	69	21.1	
			0-4	86	18.1	
2C	191	HkB	0-1	74	18.9	Pasture, native grass
			0-2	78	18.5	
			0-4	83	18.3	
3A	191	HkB	0-1	62	41.7	Pasture, native grass, few dandelions, grass greener than at #28-1
			0-2	54	39.2	
			0-4	76	32.5	
3B	191	HkB	0-1	70	41.1	Pasture, native grass
			0-2	79	41.7	
			0-4	73	31.9	
3C	191	HkB	0-1	65	29.2	Taken from slight depression near A & B, grass appeared greener
			0-2	82	28.3	
			0-4	87	23.2	

Table 7 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 28 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	191	HuD	0-1 0-2 0-4	840 833 829	18.6 21.3 20.8	50 paces short of 1/2 mile line, pasture, native grass.
4B	191	HuD	0-1 0-2 0-4	857 853 864	21.3 21.6 21.1	Pasture with native grasses
4C	191	HuD	0-1 0-2 0-4	844 845 852	20.6 20.5 23.0	Pasture with native grasses and dandelions
5A	191	HuD	0-1 0-2 0-4	839 834 830	32.1 33.3 32.3	Pasture with native grasses, sheep grazing nearby
5B	191	HuD	0-1 0-2 0-4	843 846 851	26.5 27.9 26.5	Pasture with native grasses
5C	191	HuD	0-1 0-2 0-4	856 855 860	24.8 27.1 29.9	Small pond, 100 paces east of this location
6A	191	HhB	0-1 0-2 0-4	858 854 863	19.9 18.6 16.8	Approx. 3/4 mi. from west boundary, 200 yards east of pond mentioned at 28-5, 100 yards west of end of pasture. Pasture with native grasses (short).
6B	191	HhB	0-1 0-2 0-4	861 862 859	20.0 19.2 16.3	
6C	191	HhB	0-1 0-2 0-4	837 836 832	21.6 20.1 19.6	837--Native grasses some- what taller than other areas in this pasture. 836--Soil more silty than at A & B which were sandy loam. Easier to sample than rest of the field. 6C is in gully bottom between road and location 6B.

Table 8
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from Middle Line, Sec. 27 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	182	HkB	0-1	835	14.6	Photos #6-looking south #7-looking north Winter wheat 5"-7" high
			0-2	838	9.2	
			0-4	831	15.3	
1B	182	HkB	0-1	847	12.3	
			0-2	850	14.7	
			0-4	842	15.0	
1C	182	HkB	0-1	849	10.7	
			0-2	841	12.8	
			0-4	848	15.7	
2A	182	HkB	0-1	109	5.9	Winter wheat in E-W rows 6"-8"
			0-2	116	7.0	
			0-4	117	11.5	
2B	182	HkB	0-1	128	8.6	
			0-2	132	4.6	
			0-4	124	12.0	
2C	182	HkB	0-1	140	4.5	
			0-2	141	7.2	
			0-4	133	11.7	
2.5A	182	HkB	0-1	115	8.2	10 paces east of 1/4 mile line, low area with taller wheat, wheat 8-12" high
			0-2	110	13.0	
			0-4	118	15.4	
3A	182	HkB	0-1	131	3.4	Wheat 6-8", 40 paces east of 28-2.5-A and a little higher in elevation, wheat a little less thick.
			0-2	123	8.9	
			0-4	127	13.7	
3B	182	HkB	0-1	134	5.3	
			0-2	139	10.6	
			0-4	142	11.8	
3C	182	HkB	0-1	114	4.5	
			0-2	119	6.9	
			0-4	111	13.1	

Table 8 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 27 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	182	HkA	0-1	63	4.2	Winter wheat, 8-9"
			0-2	80	9.1	
			0-4	71	18.8	
4B	182	HkA	0-1	121	7.1	
			0-2	125	10.0	
			0-4	129	10.8	
4C	182	HkA	0-1	130	5.5	Winter wheat, 8-9"
			0-2	52	10.4	
			0-4	72	11.0	
5A	177	HkA	0-1	53	11.4	Wheat stubble, summer fallow, some volunteer wheat
			0-2	64	20.5	
			0-4	81	24.4	
5B	177	HkA	0-1	112	14.5	Wheat stubble 6-9" high, about 6" between rows
			0-2	113	23.6	
			0-4	88	25.7	
5C	177	HkA	0-1	122	14.6	Wheat stubble
			0-2	120	22.4	
			0-4	126	23.6	
6A	177	HkA	0-1	975	6.6	On 1/4 section line, wheat stubble
			0-2	978	19.8	
			0-4	983	22.2	
6B	177	HkA	0-1	976	10.6	On 1/4 section line, wheat stubble
			0-2	977	18.9	
			0-4	984	21.2	
6C	177	HkA	0-1	974	17.1	Same as above
			0-2	979	20.0	
			0-4	982	21.6	

Table 8 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 27 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	177	HkA	0-1	985	9.4	100 paces east of 1/4 section line, wheat stubble, trowel used
			0-2	992	20.1	
			0-4	993	21.4	
7B	177	HkA	0-1	973	10.0	100 paces east of 1/4 section line, wheat stubble, trowel used
			0-2	980	17.0	
			0-4	981	19.8	
7C	177	HkA	0-1	1000	11.9	100 paces east of 1/4 section line, wheat stubble, trowel used
			0-2	1001	18.1	
			0-4	1008	21.4	
8A	177	HkA	0-1	987	7.2	Wheat stubble, trowel used
			0-2	988	17.2	
			0-4	1004	18.7	
8B	177	HkA	0-1	990	11.7	Wheat stubble, trowel used
			0-2	995	19.7	
			0-4	1005	20.7	
8C	177	HkA	0-1	999	14.1	Wheat stubble, trowel used
			0-2	1002	16.7	
			0-4	1007	20.1	

Table 9

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 26 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	175	HkA	0-1	989	7.7	Winter wheat, 8-10" high, 8"-9" rows O.C., trowel used
			0-2	996	11.8	
			0-4	998	13.5	
1B	175	HkA	0-1	991	5.4	Winter wheat, trowel used
			0-2	994	11.3	
			0-4	997	11.9	
1C	175	HkA	0-1	986	7.9	Winter wheat, trowel used
			0-2	1003	9.8	
			0-4	1006	11.0	
2A	175	ChA	0-1	1012	4.8	On 1/4 section line, thin density growth, trowel used
			0-2	1013	11.0	
			0-4	1014	12.9	
2B	175	ChA	0-1	1018	8.2	On 1/4 section line, winter wheat, medium density growth, trowel used
			0-2	1019	12.3	
			0-4	1020	12.7	
2C	175	ChA	0-1	1015	9.9	On 1/4 section line, winter wheat, dense growth, trowel used
			0-2	1016	11.8	
			0-4	1017	13.4	
3A	175	ChA	0-1	1024	7.9	100 paces east of 1/4 sec. line, winter wheat, trowel used
			0-2	1025	12.0	
			0-4	1026	14.4	
3B	175	ChA	0-1	1009	6.6	100 paces east of 1/4 sec. line, winter wheat, trowel used
			0-2	1010	5.9	
			0-4	1011	13.3	
3C	175	ChA	0-1	1021	7.9	100 paces east of 1/4 sec. line, winter wheat, trowel used
			0-2	1022	11.6	
			0-4	1041	14.0	

Table 9 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 26 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	175	ChA	0-1	1027	6.1	Winter wheat, trowel used
			0-2	1028	10.1	
			0-4	1029	12.8	
4B	175	ChA	0-1	1040	6.5	Winter wheat, trowel used
			0-2	1042	10.6	
			0-4	1044	13.0	
4C	175	ChA	0-1	1031	7.2	Winter wheat, trowel used
			0-2	1032	11.3	
			0-4	1033	13.7	
5A	175	ChA	0-1	1034	6.2	Summer fallow with wheat stubble and volunteer alfalfa, trowel used
			0-2	1035	11.0	
			0-4	1036	14.2	
5B	175	ChA	0-1	1023	7.8	Summer fallow with wheat stubble and volunteer alfalfa, trowel used
			0-2	1030	21.2	
			0-4	1043	14.8	
5C	175	ChA	0-1	1037	8.4	Same as above
			0-2	1038	12.8	
			0-4	1039	16.3	
6A	175	LbA	0-1	940	5.7	Same as above
			0-2	941	13.4	
			0-4	942	17.4	
6B	175	LbA	0-1	943	6.8	Same as above
			0-2	944	14.2	
			0-4	945	18.3	
6C	175	LbA	0-1	937	8.2	Same as above
			0-2	938	12.1	
			0-4	939	17.1	

Table 9 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from Middle Line, Sec. 26 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	175	LbA	0-1	960	17.1	Alfalfa field, trowel used
			0-2	961	16.4	
			0-4	965	15.6	
7B	175	LbA	0-1	950	10.6	Same as above
			0-2	951	16.5	
			0-4	955	14.5	
7C	175	LbA	0-1	952	7.7	Same as above
			0-2	953	13.4	
			0-4	954	14.4	
8A	175	LeA	0-1	970	6.0	Same as above
			0-2	971	10.2	
			0-4	972	10.3	
8B	175	LeA	0-1	957	5.4	Same as above
			0-2	958	10.6	
			0-4	959	11.0	
8C	175	LeA	0-1	946	5.8	Same as above
			0-2	947	10.8	
			0-4	948	11.0	

Table 10
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from South Line, Sec. 33 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	194	HkB	0-1	335	17.4	Photo #1 looking south, Dry down to 1.5", Loamy, organic matter in top 1", ungrazed pasture grass
			0-2	330	22.7	
			0-4	327	22.6	
1B	194	HkB	0-1	326	20.2	Same as above
			0-2	334	21.5	
			0-4	331	22.0	
1C	194	HkB	0-1	336	18.8	Same as above
			0-2	328	24.1	
			0-4	329	23.4	
2A	194	HkB	0-1	332	21.0	Same as above
			0-2	333	18.2	
			0-4	325	18.2	
2B	194	HkB	0-1	339	18.5	Same as above
			0-2	343	18.2	
			0-4	346	17.9	
2C	194	HkB	0-1	345	19.0	Same as above
			0-2	340	18.0	
			0-4	344	17.2	
3A	194	HhB	0-1	337	21.4	Ungrazed pasture grass, organic on top, less organic below
			0-2	347	22.8	
			0-4	338	25.1	
3B	194	HhB	0-1	342	15.4	Same as above
			0-2	348	23.7	
			0-4	341	24.5	
3C	194	HhB	0-1	360	20.7	Same as above
			0-2	352	24.8	
			0-4	353	25.7	

Table 10 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 33 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	194	HuD	0-1 0-2 0-4	469 473 480	24.9 22.2 19.0	Photo #2 on steep slope down to creek east side, Ungrazed native grass, moist, rocky soil, hard to penetrate, gravel at 4"
4B	194	HuD	0-1 0-2 0-4	479 474 470	19.8 22.3 19.1	Same as above
4C	194	HuD	0-1 0-2 0-4	478 475 471	17.1 20.3 20.0	Same as above
5A	195	HkB	0-1 0-2 0-4	472 476 477	10.1 15.4 16.7	Photo #3 - overview Photo #4 - closeup Winter wheat 6", silty loam, low organic matter, top dry & cracked, rows run E-W
5B	195	HkB	0-1 0-2 0-4	482 490 489	10.9 17.8 17.3	Description same as above
5C	195	HkB	0-1 0-2 0-4	481 488 487	10.1 14.8 16.5	Same as above
6A	195	HkB	0-1 0-2 0-4	502 503 498	7.7 14.7 16.8	Same vegetation as above, cracked & hard on top, very soft underneath
6B	195	HkB	0-1 0-2 0-4	495 493 499	12.9 15.4 13.7	Same as above
6C	195	HkB	0-1 0-2 0-4	501 494 500	13.7 18.7 16.2	Same as above

Table 10 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 33 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	195	HkB	0-1	483	13.3	Winter wheat 6", silty loam, low organic matter, top dry & cracked, rows run E-W
			0-2	485	20.5	
			0-4	492	20.8	
7B	195	HkB	0-1	486	13.8	Same as above
			0-2	484	16.9	
			0-4	491	20.1	
7C	195	HkB	0-1	504	13.2	Same vegetation as above, very soft & loose on surface
			0-2	497	14.6	
			0-4	496	16.0	
8A	195	HkB	0-1	399	12.1	Same as 7A above
			0-2	406	14.7	
			0-4	403	16.5	
8B	195	HkB	0-1	407	11.4	Same as above
			0-2	398	13.8	
			0-4	402	15.4	
8C	195	HkB	0-1	404	8.6	Same as above
			0-2	405	13.6	
			0-4	400	12.6	

Table 11
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from South Line, Sec. 34 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	196	HkB	0-1	408	17.2	Winter wheat 6"+, rows run N-S, soil dry & cracked on surface, some old stubble, silty loam, small amount organic matter
			0-2	397	15.6	
			0-4	401	18.9	
1B	196	HkB	0-1	413	14.5	Same as above
			0-2	412	16.5	
			0-4	420	17.7	
1C	196	HkB	0-1	419	15.0	Same as above
			0-2	411	18.2	
			0-4	414	18.0	
2A	196	HkB	0-1	409	12.2	Winter wheat 9-12", thicker than 1A above, soil similar to 1A above
			0-2	418	14.0	
			0-4	429	15.4	
2B	196	HkB	0-1	426	9.5	Same as above
			0-2	422	14.2	
			0-4	421	15.1	
2C	196	HkB	0-1	415	15.0	Same as above
			0-2	425	15.4	
			0-4	430	15.5	
3A	196	HkB	0-1	416	11.3	Wheat 6", thinner than 2A above, soil softer on surface & more rocky, silty loam, rows run E-W
			0-2	417	14.7	
			0-4	410	15.9	
3B	196	HkB	0-1	427	9.2	Same as above
			0-2	423	12.3	
			0-4	431	12.8	
3C	196	HkB	0-1	432	9.7	Same as above
			0-2	428	16.1	
			0-4	424	14.2	

Table 11 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 34 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	196	HkB	0-1	584	7.8	Photo #5 facing somewhat north, winter wheat 6" same thickness as 34-3. Soil hard, dry, cracked on surface, rows N-S.
			0-2	577	10.5	
			0-4	585	12.6	
4B	196	HkB	0-1	583	9.4	Same as above
			0-2	586	13.8	
			0-4	578	14.2	
4C	196	HkB	0-1	582	8.4	Same as above
			0-2	587	13.2	
			0-4	579	12.6	
5A	199	HkB	0-1	581	8.0	Photo #6 facing north, sparse spring wheat 3", soil very dry, hard, cracked, stubble rows N-S
			0-2	580	10.5	
			0-4	588	15.5	
5B	199	HkB	0-1	589	8.8	Same as above
			0-2	596	12.4	
			0-4	597	14.0	
5C	199	HkB	0-1	598	7.7	Same as above
			0-2	590	11.7	
			0-4	595	13.5	
6A	199	HkB	0-1	612	9.1	Same as above (rows E-W)
			0-2	605	12.5	
			0-4	604	13.4	
6B	199	HkB	0-1	603	7.2	Same as above
			0-2	606	12.1	
			0-4	611	14.5	
6C	199	HkB	0-1	599	9.2	Same as above
			0-2	594	12.5	
			0-4	591	12.2	

Table 11 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 34 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	199	HkB	0-1	593	m ^{1/}	Sparse spring wheat 3", soil very dry, hard, cracked, stubble rows N-S
			0-2	600	11.2	
			0-4	592	15.0	
7B	199	HkB	0-1	608	6.7	Same as above
			0-2	609	11.8	
			0-4	610	13.9	
7C	199	HkB	0-1	602	8.4	Same as above
			0-2	607	12.8	
			0-4	601	14.8	
8A	199	HkB	0-1	364	6.2	Same as above
			0-2	363	10.8	
			0-4	362	11.8	
8B	199	HkB	0-1	366	8.5	Same as above
			0-2	365	12.9	
			0-4	361	14.5	
8C	199	HkB	0-1	367	11.7	Same as above
			0-2	368	11.9	
			0-4	369	12.3	

^{1/}m - denotes missing sample (in this case the wet weight of the sample appeared to be in error).

Table 12

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 35 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	201	HkB	0-1	371	7.1	Photo #7 facing NNW, plowed (1"-4" dia. clods), surface dry silt, almost bare, wheat or oats stubble
			0-2	372	11.6	
			0-4	370	17.1	
1B	201	HkB	0-1	384	8.8	Description same as above
			0-2	383	15.9	
			0-4	382	16.7	
1C	201	HkB	0-1	376	7.2	Same as above
			0-2	375	9.8	
			0-4	374	16.9	
2A	201	H1A	0-1	381	7.3	Same as above
			0-2	380	14.0	
			0-4	379	16.7	
2B	201	H1A	0-1	373	6.1	Same as above
			0-2	378	11.5	
			0-4	377	18.2	
2C	201	H1A	0-1	396	8.2	Same as above
			0-2	392	12.7	
			0-4	385	16.3	
3A	201	H1A	0-1	388	9.6	Same as above
			0-2	389	10.6	
			0-4	390	12.8	
3B	201	H1A	0-1	387	11.1	Same as above
			0-2	393	10.7	
			0-4	394	15.7	
3C	201	H1A	0-1	395	7.6	Same as above
			0-2	391	14.3	
			0-4	386	15.2	

Table 12 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 35 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	201	BhA	0-1	181	6.2	Plowed (1"-4" dia. clods), surface dry silt, almost bare, wheat or oats stubble
			0-2	182	9.7	
			0-4	183	15.0	
4B	201	BhA	0-1	184	7.6	Same as above
			0-2	185	10.5	
			0-4	186	14.2	
4C	201	BhA	0-1	187	8.9	Same as above
			0-2	188	12.3	
			0-4	189	18.8	
5A	201	Tw	0-1	190	8.4	Same as above
			0-2	191	12.9	
			0-4	192	17.2	
5B	201	Tw	0-1	202	5.3	Same as above
			0-2	203	17.9	
			0-4	204	19.6	
5C	201	Tw	0-1	199	9.9	Same as above
			0-2	200	11.0	
			0-4	201	19.2	
6A	207	LeA	0-1	193	8.2	Photo #8 looking east overview, photo #9 closeup sparse 4"-6" winter wheat on plowed grassland, silty, clumps with grass roots, lot of organic matter
			0-2	195	11.9	
			0-4	194	19.4	
6B	207	LeA	0-1	196	9.4	Same as above
			0-2	197	21.4	
			0-4	198	20.5	
6C	207	LeA	0-1	205	9.0	Same as above
			0-2	206	13.8	
			0-4	207	18.1	

Table 12 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 35 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	207	LbA	0-1	208	7.8	Sparse 4"-6" winter wheat on plowed grassland, silty clumps with grass roots, lot of organic matter
			0-2	209	11.8	
			0-4	210	11.6	
7B	207	LbA	0-1	211	11.8	Same as above
			0-2	212	13.5	
			0-4	213	14.5	
7C	207	LbA	0-1	214	17.9	Same as above
			0-2	215	13.4	
			0-4	216	12.4	
8A	207	BcA	0-1	218	7.5	Photo #10 looking south, Winter wheat 6", rows N-S, some old grass clumps, dry silt w/some organic matter near surface
			0-2	219	11.3	
			0-4	217	11.0	
8B	207	BcA	0-1	220	6.8	Same as above
			0-2	221	11.9	
			0-4	222	12.3	
8C	207	BcA	0-1	223	7.2	Same as above
			0-2	224	10.7	
			0-4	225	14.0	

Table 13
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from South Line, Sec. 36 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
1A	209	BcA	0-1	226	4.4	Photo #11 looking south, New 2"-3" spring wheat on old cornfield, small clumpy, silty surface
			0-2	227	10.7	
			0-4	228	15.7	
1B	209	BcA	0-1	229	5.7	Same as above
			0-2	230	13.4	
			0-4	231	18.4	
1C	209	BcA	0-1	232	6.3	Same as above
			0-2	233	12.8	
			0-4	234	16.8	
2A	209	BcA/Tw	0-1	235	13.0	Same as above
			0-2	236	14.0	
			0-4	237	22.5	
2B	209	BcA/Tw	0-1	238	13.8	Same as above
			0-2	239	17.0	
			0-4	240	22.4	
2C	209	BcA/Tw	0-1	241	8.0	Same as above
			0-2	242	15.9	
			0-4	243	20.5	
3A	210	BcA	0-1	244	7.5	Photo #12 looking south, 6"-9" winter wheat (rows N-S), thick, hard, cracked, silty surface, small amount old corn stubble
			0-2	245	9.1	
			0-4	246	13.2	
3B	210	BcA	0-1	247	6.5	Same as above
			0-2	248	8.3	
			0-4	249	11.8	
3C	210	BcA	0-1	250	10.9	Same as above
			0-2	251	11.6	
			0-4	252	15.5	

Table 13 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 36 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
4A	210	BcA	0-1	439	11.5	6"-9" winter wheat (rows N-S), thick, hard, cracked, silty surface, small amount old corn stubble
			0-2	438	14.9	
			0-4	437	15.8	
4B	210	BcA	0-1	434	13.2	Same as above
			0-2	435	13.8	
			0-4	436	14.9	
4C	210	BcA	0-1	433	10.1	Same as above
			0-2	440	14.7	
			0-4	441	15.4	
5A	210	BcA	0-1	442	9.9	Same as above
			0-2	443	11.9	
			0-4	444	13.4	
5B	210	BcA	0-1	445	9.0	Same as above
			0-2	446	12.1	
			0-4	447	15.5	
5C	210	BcA	0-1	448	11.2	Same as above
			0-2	449	16.8	
			0-4	450	16.3	
6A	210	HkA	0-1	451	11.2	Same as above
			0-2	452	10.9	
			0-4	453	12.7	
6B	210	HkA	0-1	454	6.1	Same as above
			0-2	455	12.1	
			0-4	456	14.0	
6C	210	HkA	0-1	457	7.0	Same as above
			0-2	458	8.3	
			0-4	459	14.9	

Table 13 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 36 Range 68W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
7A	233	BcA	0-1	460	17.3	Photo #13 looking south, photo #14 closeup, ungrazed native pasture grass, lots of roots, moist to surface
			0-2	462	15.7	
			0-4	461	17.4	
7B	233	BcA	0-1	463	7.0	Same as above
			0-2	464	14.4	
			0-4	465	17.6	
7C	233	BcA	0-1	466	16.8	Same as above
			0-2	467	17.6	
			0-4	468	18.4	
8A	233	BcA	0-1	349	6.3	Same as above
			0-2	351	9.8	
			0-4	350	11.4	
8B	233	BcA	0-1	354	5.3	Same as above
			0-2	355	7.3	
			0-4	356	10.7	
8C	233	BcA	0-1	357	14.1	Same as above
			0-2	358	16.1	
			0-4	359	16.5	

Table 14
Soil Moisture Mission
April 27, 1976
Hand County, South Dakota Site
Data from South Line, Sec. 32 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
5A	232	HkA	0-1	253	6.2	Photo #15 looking SW, photo #16 closeup, freshly plowed under pasture grass, furrowing 4"-6" deep SW-NE
			0-2	254	10.1	
			0-4	255	12.9	
5B	232	HkA	0-1	256	5.6	Same as above
			0-2	257	12.2	
			0-4	258	14.1	
5C	232	HkA	0-1	259	6.6	Same as above
			0-2	260	11.1	
			0-4	261	14.8	
6A	232	HkA	0-1	262	5.5	Same as above
			0-2	263	18.7	
			0-4	264	19.8	
6B	232	HkA	0-1	265	11.8	Same as above
			0-2	266	16.6	
			0-4	267	16.2	
6C	232	HkA	0-1	268	9.5	Same as above
			0-2	269	16.1	
			0-4	270	18.8	
7A	235	HkA	0-1	271	15.6	Ungrazed native pasture grass, lots of roots, moist to surface
			0-2	272	20.2	
			0-4	273	20.4	
7B	235	HkA	0-1	274	16.7	Same as above
			0-2	275	19.2	
			0-4	276	20.7	
7C	235	HkA	0-1	277	15.2	Same as above
			0-2	278	18.9	
			0-4	279	19.5	

Table 14 (continued)

Soil Moisture MissionApril 27, 1976Hand County, South Dakota SiteData from South Line, Sec. 32 Range 67W Township 113N

<u>Point</u>	<u>NASA Field No.</u>	<u>Soil Type</u>	<u>Horizon (inches)</u>	<u>Soil Tin</u>	<u>Soil Moisture (%)</u>	<u>Remarks</u>
8A	235	HhB	0-1	280	20.1	Photo #17 looking south, photo #18 closeup, ungrazed native pasture grass, lots of roots, moist to surface
			0-2	281	23.0	
			0-4	282	23.5	
8B	235	HhB	0-1	283	24.7	Same as above
			0-2	284	32.4	
			0-4	285	30.9	
8C	235	HhB	0-1	286	20.9	Same as above
			0-2	287	26.0	
			0-4	288	25.2	

Table 15
Winter Wheat Soil Moisture
by Selected Fields

<u>Line</u> <u>Field</u>	<u>N</u> <u>110</u>	<u>M</u> <u>182</u>	<u>M</u> <u>175</u>	<u>S</u> <u>195</u>	<u>S</u> <u>196</u>	<u>S</u> <u>210</u>	<u>Weighted</u> <u>means</u>
0"-1"							
\bar{x}	7.5%	7.3%	7.2%	11.5%	11.6%	9.5%	8.8%
σ_x	2.7%	3.4%	1.3%	2.0%	3.1%	2.3%	-
n	21	13	18	12	12	12	88
0"-2"							
\bar{x}	12.4%	9.6%	11.9%	15.9%	14.5%	12.0%	12.6%
σ_x	1.5%	2.8%	2.9%	2.1%	2.0%	2.7%	-
n	21	13	18	12	12	12	88
0"-4"							
\bar{x}	14.2%	13.5%	14.2%	16.6%	15.2%	14.5%	14.6%
σ_x	1.8%	2.4%	2.0%	2.3%	2.1%	1.4%	-
n	21	13	18	12	12	12	88
Dominant soil type	HkB	HkB	ChA	HkB	HkB	BcA	

Table 16
Spring Wheat Soil Moisture
by Selected Fields

<u>Line</u> <u>Field</u>	<u>N</u> <u>115</u>	<u>N</u> <u>123</u>	<u>N</u> <u>132</u>	<u>S</u> <u>199</u>	<u>S</u> <u>209</u>	<u>Weighted</u> <u>means</u>
0"-1"						
\bar{x}	6.0%	10.4%	8.9%	8.3%	8.5%	8.9%
σ_x	1.4%	1.3%	1.9%	1.5%	3.3%	-
n	6	18	24	11	9	68
0"-2"						
\bar{x}	16.6%	16.1%	15.6%	11.9%	12.5%	14.8%
σ_x	3.1%	2.0%	1.9%	0.8%	2.9%	-
n	6	18	24	12	9	69
0"-4"						
\bar{x}	19.3%	18.4%	19.2%	13.8%	17.4%	17.8%
σ_x	1.2%	1.9%	2.4%	1.2%	3.8%	-
n	6	18	24	12	9	69
Dominant soil type	HkB HkA	Cha	Tw HkA H1A	HkB	BcA	

REFERENCES

White, E. M., Westin, F. C., and Buntley, G. J., 1963, Soil Survey of Hand County, South Dakota; USDA Soil Conservation Service in cooperation with South Dakota Agricultural Experiment Station, Series 1956, No. 21, U. S. Government Printing Office, Washington, DC, 112 pp plus maps.

APPENDIX A

Report on Textural Analysis

Empire Laboratories, Inc.

P.O. Box 429 • 214 North Howes
Fort Collins, Colorado 80522 • Telephone (303) 484-0359

May 26, 1976

M. W. Bittinger and Associates
105 South Meldrum
Post Office Box Q
Fort Collins, CO 80522

Attention: Mr. Bruce Jones

Gentlemen:

Re: Soil Samples - Miller, South Dakota
ELI Project No. 2262-76

Enclosed please find laboratory test results run on four (4) representative samples formed by combining moisture samples from the above-referenced site. The grain size distribution curve and U. S. Bureau of Public Roads soil classification were determined for the four (4) combined samples. A summary of test data and curves showing this data are included on pages 2 through 6.

Very truly yours,

EMPIRE LABORATORIES, INC.



Neil R. Sherrod
Engineering Geologist

jib



SUMMARY OF GRAIN SIZE DISTRIBUTION RESULTS

Samples for M. W. Bittinger and Associates

Re: Miller, South Dakota Site

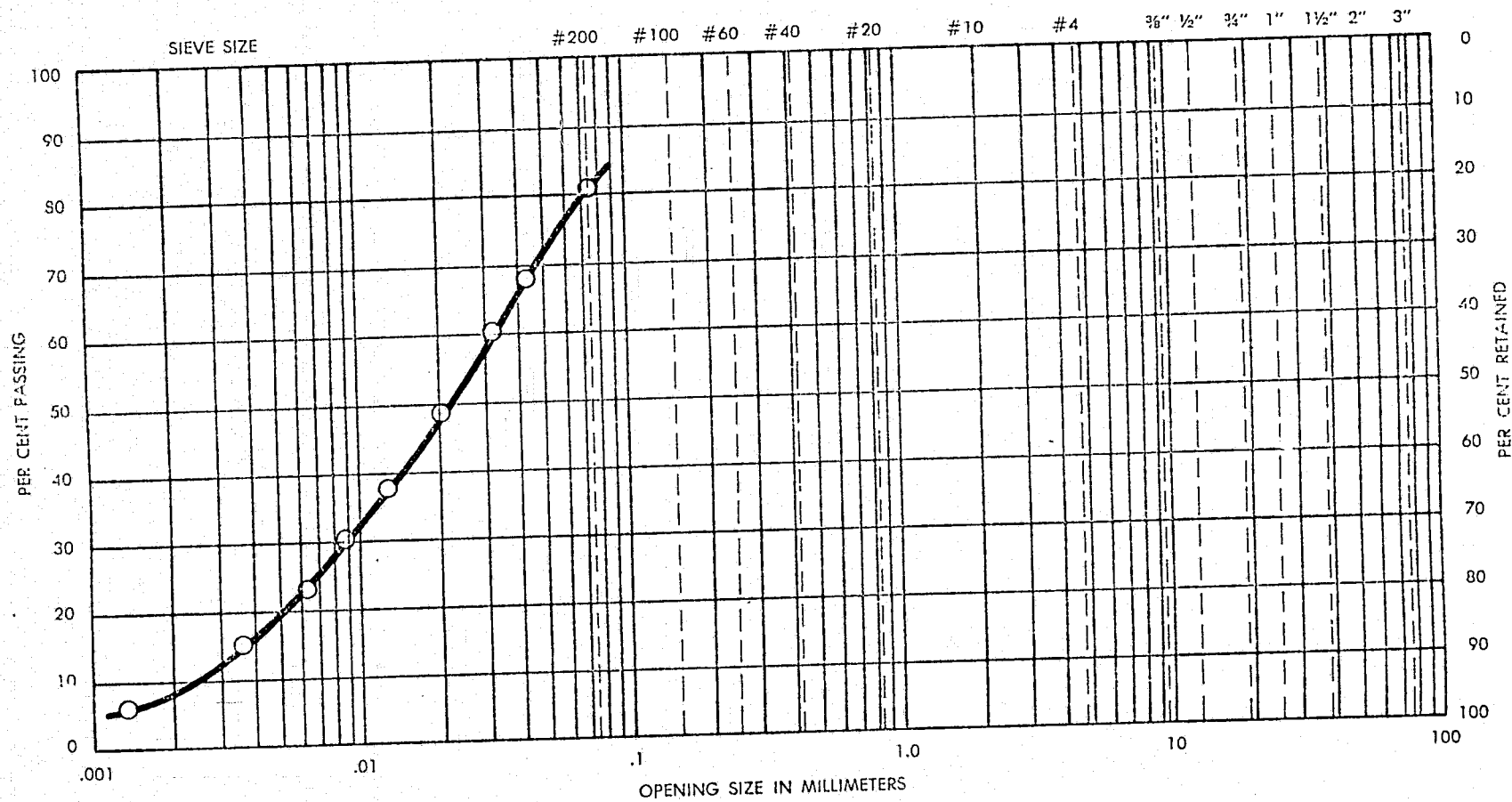
<u>Location *</u>	<u>% Sand 2. 0mm- . 05mm</u>	<u>% Silt . 05mm- . 005mm</u>	<u>% Clay Less than . 005mm</u>	<u>Classification U. S. Bureau of Public Roads</u>
BCA South Line	29. 3	51. 2	19. 5	Silt Loam
CHA North Line	28. 8	50. 6	20. 6	Silty Clay Loam
HKB North Line	44. 4	37. 9	17. 7	Loam
HKB South Line	32. 2	48. 7	19. 1	Loam

Note* Each location includes the following sample Nos.

<u>BCA</u>	<u>CHA</u>	<u>HKB North Line</u>	<u>HKB South Line</u>
217	904 784	558 663	327 414 361
222	918 809	563 673	331 429 369
225	916 815	575 667	329 421
228	914 807	569 674	325 430
231	913 816	555	346 410
234	930 814	573	344 431
246	932 811	733	477 424
249	925 705	748	489 585
252	931 686	735	487 578
437	757 689	744	498 579
436	766 706	743	499 588
441	765 687	724	500 597
444	761 696	658	492 595
447	773 697	651	491 604
450	774 711	654	496 611
461	771 714	660	403 591
465	781 715	755	402 592
468	789 716	747	400 610
350	788 708	671	401 601
356	790	649	420 362
359			

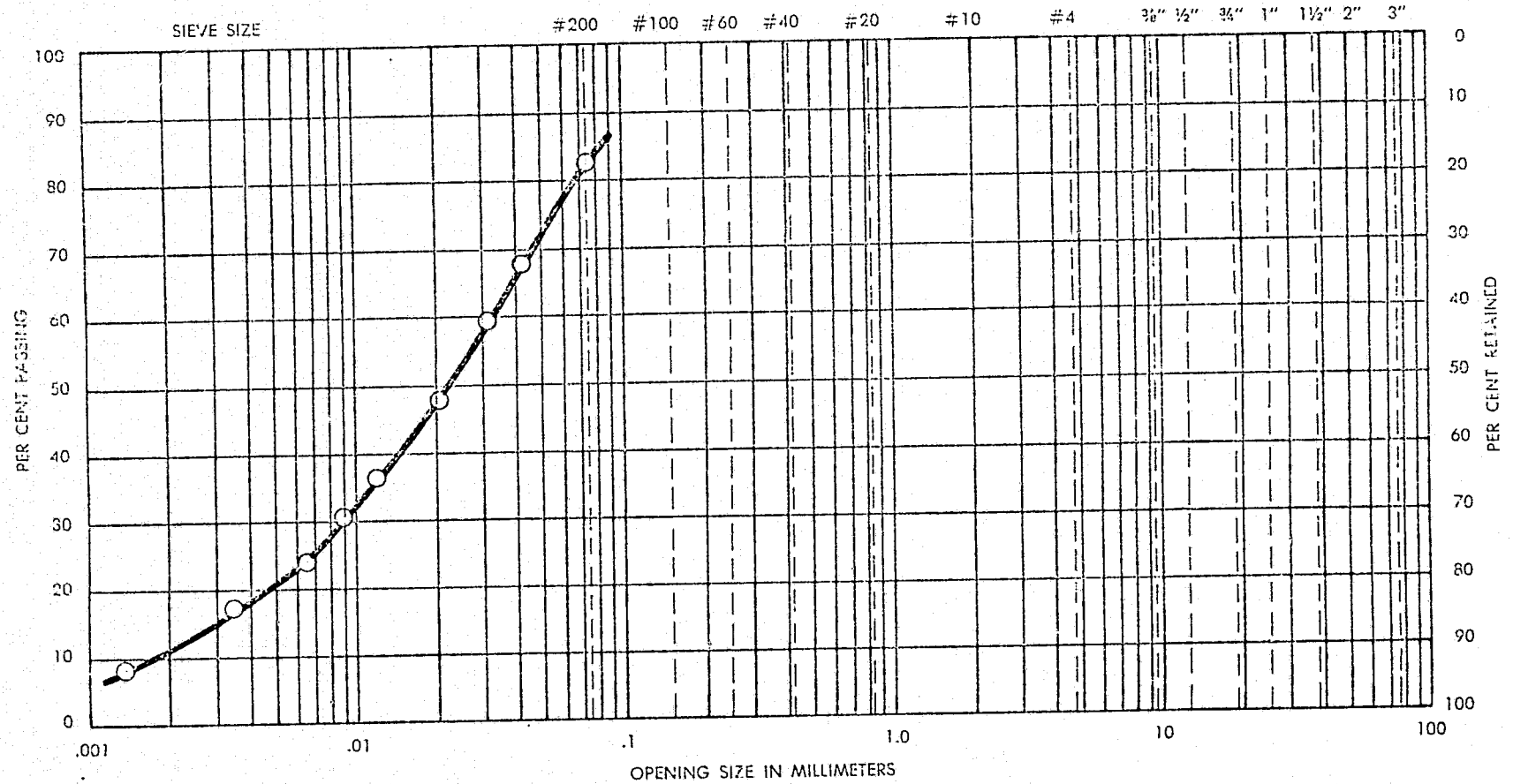
GRAIN SIZE DISTRIBUTION CURVE

LOCATION OF SAMPLE: BCA South Line



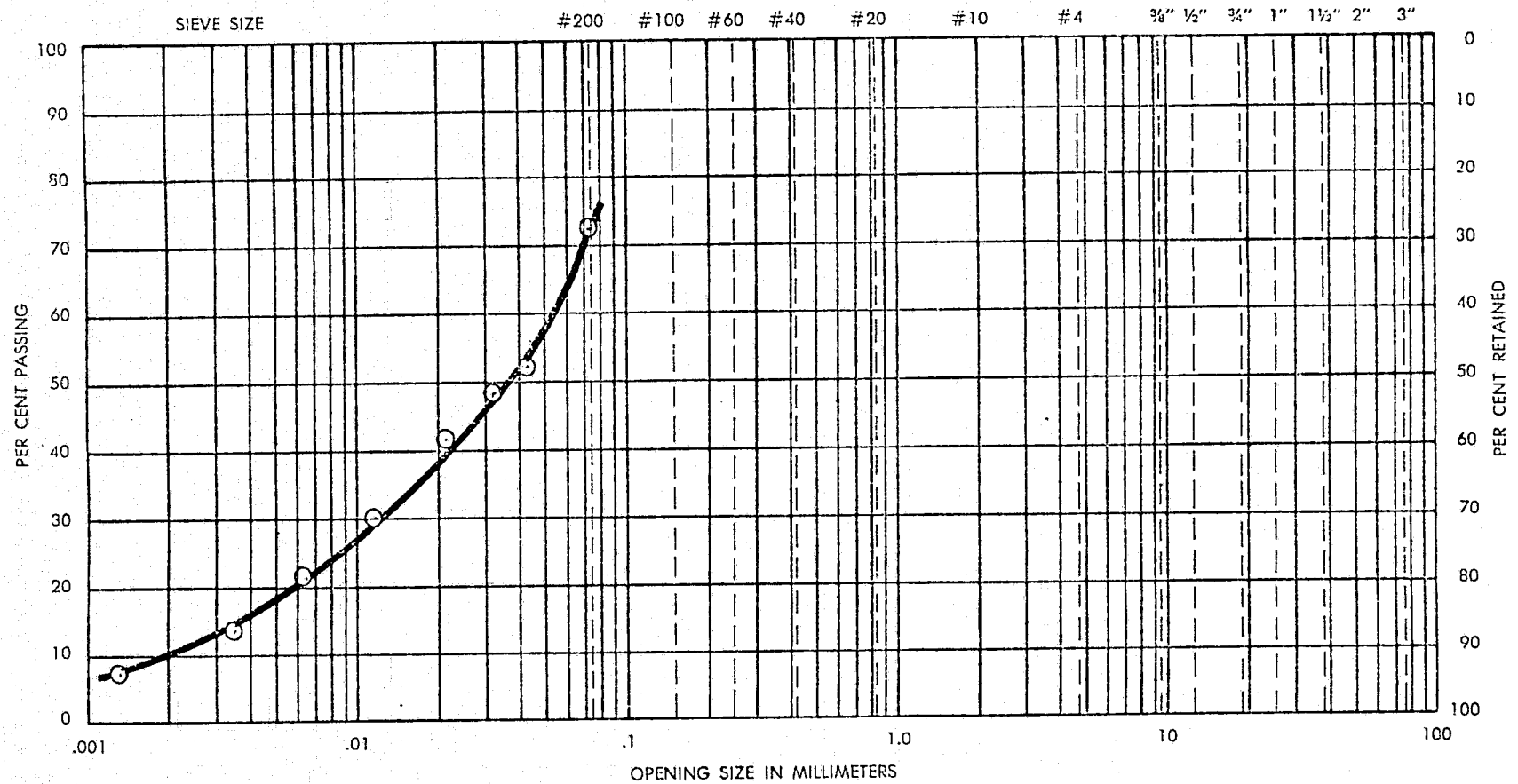
GRAIN SIZE DISTRIBUTION CURVE

LOCATION OF SAMPLE: CHA North Line



GRAIN SIZE DISTRIBUTION CURVE

LOCATION OF SAMPLE: HKB North Line



GRAIN SIZE DISTRIBUTION CURVE

LOCATION OF SAMPLE: HKB South Line

